



JLL TCFD 2022 Report

July 2022



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Overview

About JLL

JLL (NYSE: JLL) is a leading professional services firm that specializes in real estate and investment management. JLL shapes the future of real estate for a better world by using the most advanced technology to create rewarding opportunities, amazing spaces and sustainable real estate solutions for our clients, our people and our communities. JLL is a Fortune 500 company with annual revenue of \$19.4 billion, operations in over 80 countries and a global workforce of more than 98,000 as of December 31, 2021. JLL is the brand name, and a registered trademark, of Jones Lang LaSalle Incorporated.

About this report

JLL is committed to transparency regarding climate-related risks and opportunities. We know it is critical to maintain the trust of our stakeholders and provide investors with a better understanding of the implication of climate change. Additionally transparency creates opportunities to collaborate on climate solutions with our peers, which helps accelerate progress across the sector.

The development of this report was the result of a cross-functional working group, together with a third-party, and is our third published report under the guidelines of the [Taskforce on Climate-Related Financial Disclosures \(TCFD\)](#). It is our first qualitative assessment and standalone report. We have enhanced our models for both physical and transition risks in this phase, and we continue to take proactive steps as part of our disciplined approach to define and model how climate change may impact our operations and business. We expect to update our analysis as our internal actions and governance practices evolve.

Executive summary

In 2019, we voiced our support for the recommendations made by the Taskforce on Climate-related Financial Disclosures (TCFD). Significantly, this undertaking has taken us beyond performance reporting against sustainability targets to an evaluation of how climate change could impact our business, and it is now a key component of our commitment to transparency for all our stakeholders. We have found the evaluation process to be as valuable as the conclusions, not just requiring scrutiny of our own operations but also a unique set of external considerations.

The latest data from the [UN Intergovernmental Panel on Climate Change \(IPCC\) report](#) makes clear that while governments and companies are setting increasingly ambitious targets, our collective commitments have yet to bend the curve in emissions' growth. The built environment sector in particular faces challenges. For example: development and design decisions can dictate a property's energy, carbon and water footprints for years, and therefore limit future mitigation options. We recognize and embrace our role in overcoming these challenges and accelerating the decarbonization of our industry, creating pathways for ourselves and our clients to a net-zero carbon future.

Since our commitment to the TCFD recommendations, we have employed a phased approach to our process. Our first phase report, completed in 2019, considered climate impacts on our business from a qualitative perspective, while our second phase report in 2020 assessed the physical effects of climate change on some of our most prominent office locations. The findings for each report were published in JLL's Global Sustainability Reports for each respective year. This, our third TCFD report, is a quantitative assessment of the climate opportunities and risks to our business, and a summary of its findings was published in our 10-K on February 28, 2022. As a result of our latest analysis, we anticipate greater opportunities than risks for our business due to our business model, adoption of ambitious targets, and mitigation measures that are planned or already in place.

The overwhelming urgency of the moment and the need to act now cannot be overstated. JLL is resolved to lead by example and invites you to join us in shaping the future of real estate for a better world.

Christian Ulbrich, CEO

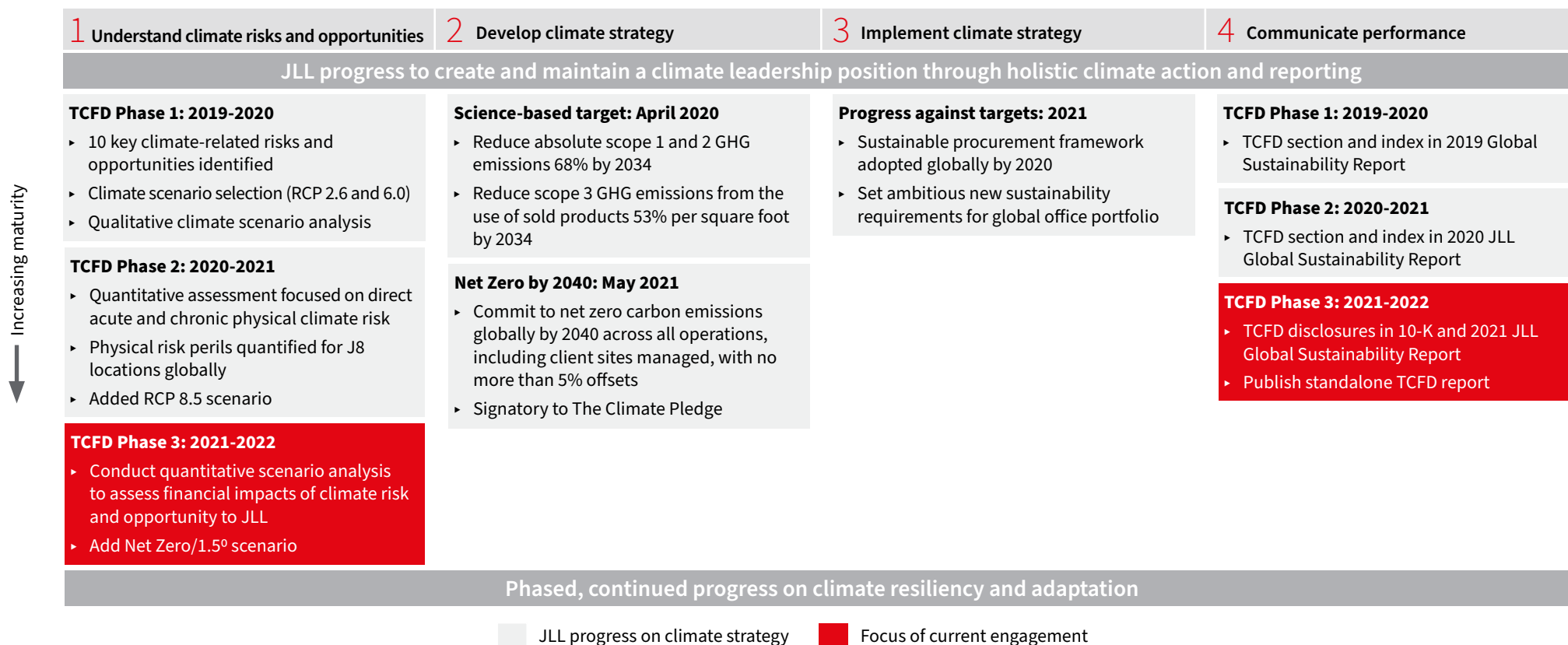
Karen Brennan, CFO

Phase 1 and Phase 2 summary

In 2019, as part of our sustainability leadership commitment, we announced our support for the recommendations made by the TCFD and began a multi-year process to evaluate (with subsequent refinements) the potential risks and opportunities to our business resulting from climate change. A summary

of our phased approach can be seen in **Figure 1**. Thus far, each phase has provided important learnings for us to build upon, while also demonstrating that our business model, capabilities and commitments present JLL with more opportunities than risks.

Figure 1. JLL climate risk journey



In our initial assessment (phase 1), we identified two scenarios based on the IPCC’s Representative Concentration Pathways (RCPs). The models we focused on were: (1) a best-case scenario where the global average temperature increases by less than 2°C, and (2) an intermediate scenario where temperatures increase between 2° and 3.7°C by the end of the century. Against those models we identified seven top climate-related risks and opportunities and conducted a qualitative assessment of the potential impacts they would have on JLL’s business. Our analysis revealed greater opportunities than risks, primarily through the expansion of service offerings and technology investments to help our clients transition to a low-carbon economy.

Phase 2 of our process (2020) involved an evaluation of climate-related physical threats to our headquarter locations in our top eight countries: Sydney, Shanghai, Paris, Frankfurt, Mumbai, Tokyo, London, and Chicago. It was used to inform considerations for the risk profile of current and future locations, resilience, and adaptation measures, as well as potential client offerings. In this analysis, a worst-case climate scenario of more than 5°C warming was added to the best-case and intermediate scenarios. Climate science models were also applied to qualitatively assess direct physical rather than transitional climate risk. They were used to consider chronic (e.g., temperature, precipitation patterns or sea-level rise) and acute (e.g., extreme weather events like storms or wildfires) climate drivers. We explicitly measured the threats that a location will be exposed to between the years 2020-2050.

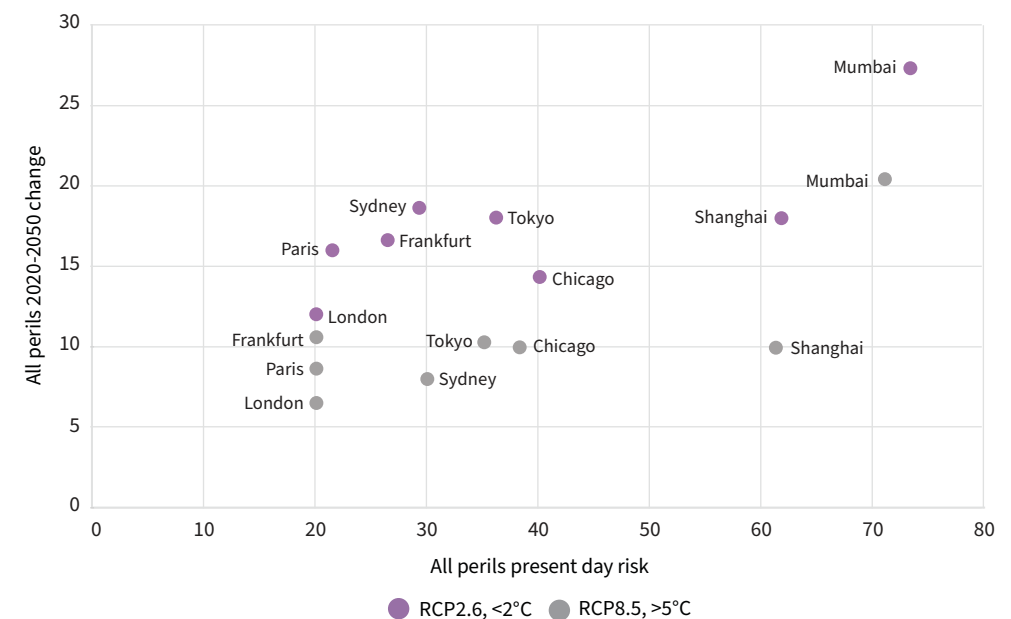
The key findings of our risk analysis disclosed:

- Strong signals of not only a warming and drying climate in all our headquarter locations, but also evidence of the shift to more extreme swings of acute weather events.

- The impacts are potentially significant and varied across geographies, and they intensify with increasing temperature, although most locations remain at a manageable risk.
- Of the eight locations, Mumbai and Shanghai, and to a lesser degree Tokyo and Sydney, are predicted to be less stable.

In assessing the risk and exposure to our headquarter locations, we evaluated six threats independently to enable a more in-depth view of the underlying drivers of change. Our conclusions at the individual threat level are also reflected in **Figure 2** where all threats are combined into a single view covering both scenarios. The level of climate risk is shown in two dimensions: the present-day level of risk, and how quickly that risk changes over time (2020-2050).

Figure 2. Perils risk score for JLL country headquarters



Phase 3 quantitative assessment

In 2021, building on the results of the previous phases, we conducted a quantitative climate scenario analysis. In this phase 3 evaluation, all top climate related risks and opportunities, excluding reputation¹, were assessed and their potential financial impacts on our business modeled. We selected ten markets which are geographically dispersed and represent 25% of our total fee revenue. Thirty top markets were initially assessed by their key physical climate risks, market revenue (modelled GDP) and market resilience to arrive at the top ten for analysis: Beijing, Shanghai, Houston,

New York, Paris, Los Angeles, London, Hong Kong, Singapore, and Tokyo. We estimated the impacts of physical risks (temperature and sea-level rise and extreme climate shocks) in 10 higher-risk JLL cities, and transition risks and opportunities (carbon pricing, climate technology disruption, climate change consultancy and climate migration) globally by 2030 and by 2050.

Figure 3 details both the selected top/key risks and opportunities as well as the assessment approach.

Figure 3. Top risks and opportunities

	Category	JLL Key climate-related risks and opportunities	Assessment approach
Physical	Acute	<ul style="list-style-type: none"> Risk of extreme weather events impacting properties that JLL leases, manages, occupies, advises, and invests in 	<ul style="list-style-type: none"> Select 10 markets at intersection of high JLL revenue and high physical climate risk Estimate climate impacts on GDP using three climate scenarios Correlate JLL historical revenue with historical GDP Estimate financial impact of climate on JLL revenue in markets
	Chronic	<ul style="list-style-type: none"> Risk of sea level rise impacting properties that JLL leases manages, occupies, advises, and invests in 	
Transition	Policy and Legal	<ul style="list-style-type: none"> Risk of regulatory change increasing costs due to carbon pricing, taxes, or cap & trade 	<ul style="list-style-type: none"> Forecast JLL emissions reduction pathway and cost of carbon pricing in three climate scenarios
	Technology	<ul style="list-style-type: none"> Risk or opportunity of technology disruption, including building automation and renewable technologies, impacting competitive position, costs, and revenues 	<ul style="list-style-type: none"> Estimate JLL revenue from building energy technology. Forecast changes in tech market and JLL opportunity in three scenarios
	Market	<ul style="list-style-type: none"> Opportunity of increasing revenue from climate change consultancy, property resilience advisory and energy management services Risk or opportunity of climate migration shifting current markets and potentially creating new markets 	<ul style="list-style-type: none"> Forecast JLL revenue from climate consultancy based on growth plans and market growth rates under three climate scenarios Estimate financial impact of climate driven outmigration on top markets using GDP approach in physical risks analysis below
	Reputation	<ul style="list-style-type: none"> Risk or opportunity of perceived adequacy of climate action advice and JLL response impacting client reputation, revenue, and workforce metrics 	<ul style="list-style-type: none"> Out of scope

¹Due to the unique considerations associated with reputational risk, we will address it in a future evaluation.

Although climate scenario analysis does not predict future events, it can be a tool for exploring a variety of possible futures, with every scenario incorporating different assumptions, drivers and levels of detail. In keeping with market trends and our own net zero commitment, we updated our best-case scenario (less than 2°C warming) in this phase to a net-zero scenario which is aligned with limiting warming to less than 1.5°C.

Across all three climate scenarios, our analysis indicates that the potential financial opportunities to JLL are greater than the financial risks, with the strongest opportunities existing under the net-zero scenario. At the same time, we anticipate lower climate-related financial risks to JLL as our business model is not carbon-intensive and mitigation measures are already in place for many risks. Moreover, our investments in property technology, our green building solutions and our climate change consulting capability provide significant and scalable pathways to realize the identified climate-related opportunities.

We acknowledge that due to evolving science and the use of historical data in the modeling - that may not fully capture how climate change will impact future conditions - there are limitations to our current analysis.

Time horizons and climate scenarios

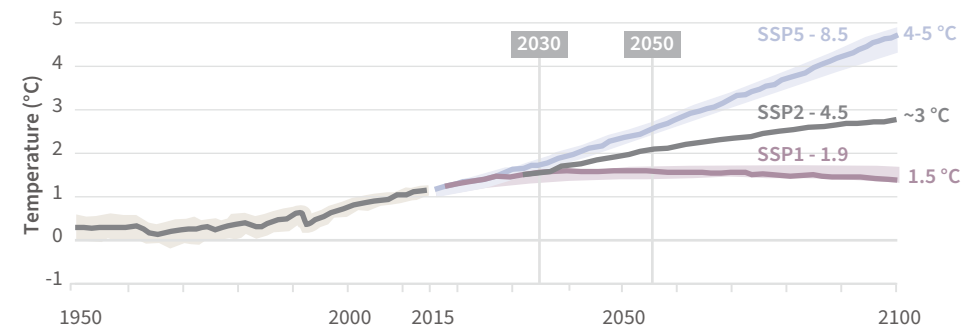
To quantify the financial impacts on JLL of climate risks and opportunities, we considered:

- Two time horizons: 2030 (short) and 2050 (medium)
- Three climate scenarios:

Net Zero by 2050 (1.5°C),
Moderate Action (2-3°C) and
Business as Usual (BAU) (4-5+°C)

There is little divergence between the scenarios through 2030 due to the delayed emergence of climate change impacts. While the warming effect of many of the existing emissions in the atmosphere are ‘baked in,’ these impacts are not likely to be felt for several decades (**Figure 4**).

Figure 4. U.N. IPCC (Intergovernmental Panel on Climate Change) AR6 climate scenarios



Climate scenario data from three leading sources: [IPCC AR6](#), [NGFS Phase II](#), and [IEA World Energy Outlook 2021](#)

Assumptions

For each of the three selected climate scenarios in the analysis, there are a series of assumptions which are shown in **Figure 5**.

Figure 5. Illustrative aspects of climate scenarios

	Net zero by 2050	Moderate action	Business-as-usual
Primary risks tested	<p>Transition risks are more pronounced:</p> <ul style="list-style-type: none"> ▶ Carbon pricing ▶ Reputation based on climate action expectation ▶ Technology transition becomes rapid ▶ Market shifts quickly to renewables and away from fossil fuels 	<p>Transition and Physical risks more balanced:</p> <ul style="list-style-type: none"> ▶ Carbon pricing is slower but still important ▶ Market shifts gradually to renewables and away from fossil fuels ▶ Technological transition is slow to take hold 	<p>Physical risks are more pronounced:</p> <ul style="list-style-type: none"> ▶ Acute risks like extreme weather (hurricane, inversions, etc.) at increasing frequency ▶ Chronic risks like temperature rise, drought, increasing vector borne disease
Carbon price	\$486/tCO ₂ by 2050 (NGFS)	\$120/tCO ₂ by 2050 (NGFS)	\$6/tCO ₂ by 2050 (NGFS)
Energy efficiency	~3% annual energy intensity reduction from 2020-2050; 85% of zero-carbon-ready buildings in total stock by 2050 (IEA NZE2050)	~2% annual energy intensity reduction from 2020-2050 (NGFS)	~1.5% annual energy intensity reduction from 2020-2050 (NGFS)
Temperature rise	~1.6°C (2.8°F) by 2050 vs. preindustrial levels, held to below 1.5°C by 2100 (IPCC)	<2°C (3.6° F) by 2050, warming up to -3°C (54° F) expected by 2100 (IPCC)	~2°C (3.6° F) by 2050, warming up to -5+°C (9° F) expected by 2100 (IPCC)
Sea level rise	~1.3 ft (0.4m) by 2050; 1.5ft (-0.5m) by 2100 (IPCC)	~1.3ft (0.4m) by 2050; 2.5ft (-0.75m) by 2100 (IPCC)	~1.3 ft by 2050; 3ft (-1m) by 2100 (IPCC)
Example impacts	<ul style="list-style-type: none"> ▶ ~60% reduction in air pollution from energy ▶ ~ 6% of insects, 8% of plants and 4% of vertebrates are projected to lose over half of their climatically determined geographic range 	<ul style="list-style-type: none"> ▶ ~14% reduction of access to freshwater ▶ ~ 6% increase in the global proportion of land under drought ▶ ~Doubling of wildfire damage compared to +1-2 °C 	<ul style="list-style-type: none"> ▶ Up to four times the wildfire damage compared to 1.5°C ▶ 45-87% increase in the frequency of Category 4 and 5 hurricanes ▶ 21-52% of plant and animal species committed to extinction due to climate change

Results of physical risks

In quantifying the financial impacts of physical climate risks, we analyzed 10 of JLL’s top markets with a geographic distribution across our three global regions, which represent 25% of our total fee revenue. 30 major JLL markets were initially assessed by their key physical climate risks (e.g., tropical storm, wildfire, extreme heat and water scarcity), market revenue and market resilience to determine the 10 select markets for analysis.

To factor in the broader economic impacts from climate change into our analysis, we modeled GDP at risk in each market due to select physical climate risks. To estimate the impacts on JLL revenue, physical risks and their projected effects on gross domestic product (GDP) under the three climate scenarios were scrutinized. Our methodology involved looking at the relationship between JLL revenue and local market conditions measured by GDP, which according to our analysis is the strongest correlation to JLL

revenue. We linked GDP to JLL’s current and historical revenue streams (based on a sample of cities in which JLL operates) to assess the financial impacts of a shift in GDP expected from climate change for the 10 selected markets.

The impacts that were evaluated include the effect of temperature increase on productivity², sea-level rise and its relationship to land productivity, extreme climate shocks, and capital depreciation (**Figure 6**). We also considered climate-induced effects on outmigration³, based on extreme heat days. While we did not model outmigration quantitatively, we anticipate that client mobility needs could lead to an increase in demand for select real estate services. Estimates of the impact of climate change on migration are especially uncertain; as such, this methodology and the results it produces should be viewed as high level.

Figure 6. Impact of physical risk factors on JLL fee revenue from 10 select markets

Year	Scenario	Temperature increase forecast (°C)	Temperature impact on productivity	Sea-level rise impact on production	Extreme climate shocks	Outmigration impact on production	% change 10 select markets JLL fee revenue	\$M impact scaled to 2020 10 select markets JLL fee revenue
2030	Net Zero 2050	1.5	-0.3%	•	•	•	-0.4%	-\$6
	Moderate action	1.5	-0.3%	•	•	•	-0.4%	-\$6
	Business-as-usual	1.6	-0.4%	•	-0.1%	•	-0.5%	-\$7
2050	Net Zero 2050	1.6	-0.4%	•	-0.1%	-0.1%	-0.6%	-\$8
	Moderate action	2.0	-0.7%	•	-0.1%	-0.2%	-1.0%	-\$15
	Business-as-usual	2.4	-1.0%	•	-0.1%	-0.3%	-1.4%	-\$21

(The impacts are projected for 10 select markets not the entire portfolio.)

² The analysis of the impact of temperature increases on productivity relies on the July 2021 analysis from the Network for Greening the Financial System (NGFS); members of the NGFS include the Bank of England, the European Central Bank and the US Federal Reserve. National-level estimates were downscaled with analysis by an external consultant of subnational NGFS estimates of the impact of heat stress on labor productivity.

³ Outmigration: to leave one region or community, usually within the same country, in order to settle in another especially as part of a large-scale and continuing movement of population.

The analysis shows minimal financial impact overall to the 10 JLL markets in 2030. The divergence between the three scenarios becomes increasingly pronounced in 2050, where physical climate risks as well as estimated financial costs are significantly higher under a business-as-usual scenario.

Peer-reviewed academic research on the economic implications of climate change has limitations, like using historical data that may not fully capture how climate change will impact future economic conditions. Accordingly, estimates produced by this analysis such as extreme climate shocks should be viewed as high level and potentially understated.

Results of transition risks and opportunities

Transition risks and opportunities is the other of the two major categories of climate risks and opportunities identified by the TCFD. These arise from policy changes, technological innovations, market changes and other factors that result from the rapid transition to a low-carbon future.

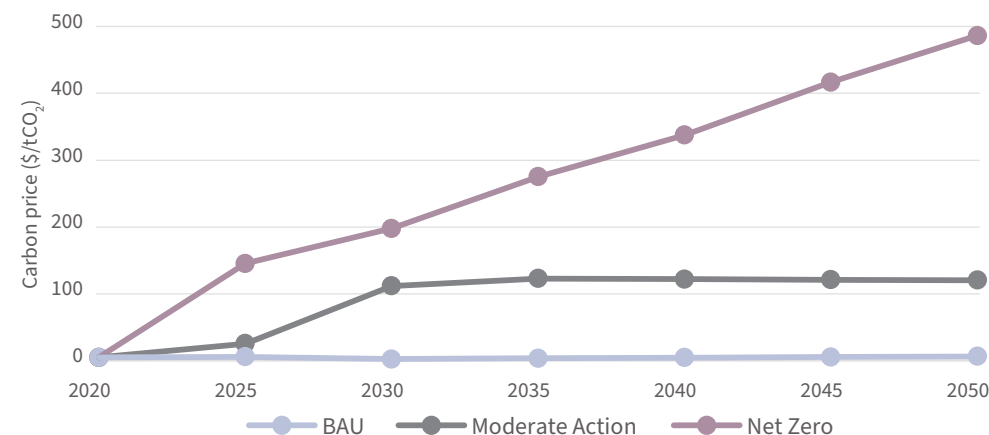
In our transition risk and opportunities assessment, we evaluated the risk of a carbon tax policy, building energy technology disruption and its associated opportunities, and market opportunities arising for our climate change consulting services. The addition of the net-zero scenario here would require even quicker policy and behavioral changes, such as the rapid adoption of renewable energy, global coordination and agreement on carbon pricing, as well as significant shifts in consumer behavior towards climate-friendly products.

Carbon tax risk

In a net-zero or moderate action scenario, transition risks have a greater potential impact than physical risks. In particular, carbon pricing regulation is very likely in both these scenarios, which could lead to slightly increased operating costs for JLL. Even though we do not own the buildings we occupy and would therefore not be directly accountable for a carbon tax, costs could be passed on via our value chain.

The carbon tax implications for JLL were calculated to determine the potential costs due to carbon pricing under the three climate scenarios. The analysis was based on our scope 1 and 2 emissions, which are less than 1% of our total emissions, and we assumed a direct cost for scope 1 and increased energy costs passed through for scope 2. Scope 3 value-chain emissions, which are more than 99% of our total, or any other potential pass-through costs in the value chain were not modeled. The pricing assumptions used were based on [NGFS climate scenarios](#) and can be seen in **Figure 7**, showing a 2030 price of \$198/tCO₂ under a net-zero scenario, scaling to \$486/tCO₂ in 2050. These aggressive carbon tax assumptions aim to stress test carbon price risk.

Figure 7. Estimated future global carbon price (\$/tCO₂) under three NGFS scenarios



JLL scope 1 and 2 emissions were modeled based on the assumption that historical 2018 emissions are reduced 51% by 2030 to achieve our near-term science-based target and then cut to zero by 2040 to meet our ‘net zero by 2040’ target. The tax implications are considerably lowered if JLL achieves its ‘net zero by 2040’ climate targets. However, modeling JLL’s emissions’ growth at 3% annually, the cumulative carbon tax cost for JLL under net zero would reach over \$500M in the years 2022-2050.

These results suggest that carbon tax is unlikely to have a material impact on our business, especially given JLL’s existing ‘net zero by 2040’ plans and our roadmap to rapidly reduce emissions (**Figure 8 and Figure 9**).

Figure 8. Carbon tax implications for “JLL increasing emissions” pathway

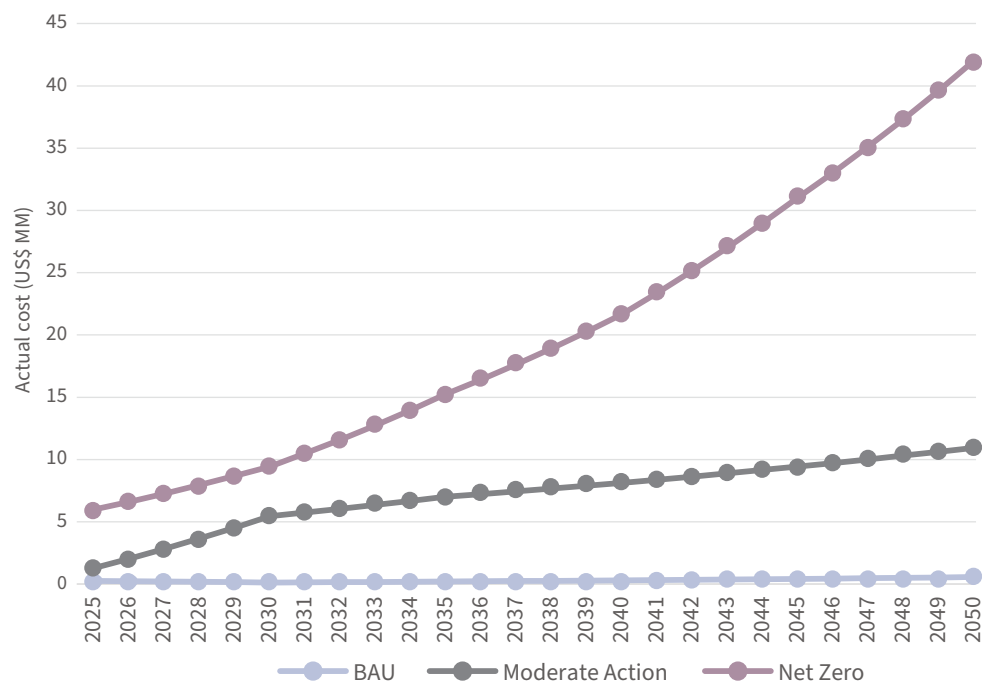
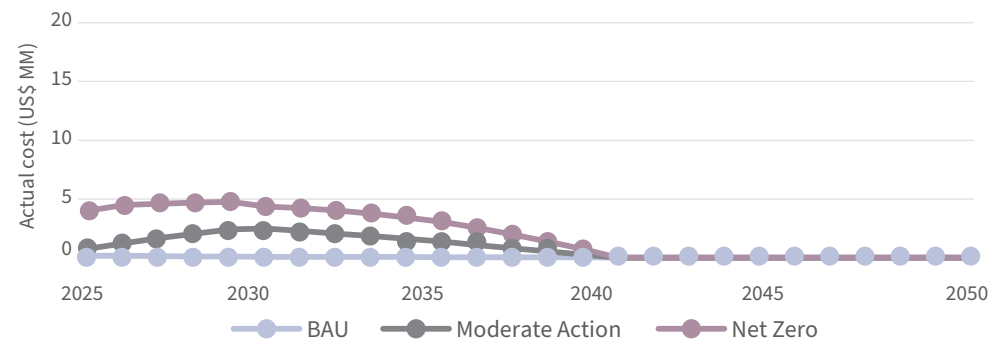


Figure 9. Carbon tax implications for “JLL achieves targets” pathway



Technology disruption opportunity

Existing and emerging energy technology – such as smart buildings, AI, machine learning and grid-interactive efficiency buildings – will undoubtedly disrupt current real estate and energy management practices over the coming decades. And this trend is more pronounced in a net-zero scenario where there is rapid adoption of renewable energy and efficiency measures supported by strong policy and carbon pricing.

As part of our analysis, we evaluated the opportunity and/or risks associated with technology disruption under our three selected scenarios. Our assumptions for each of the scenarios are drawn from the [IEA World Energy Outlook 2021](#). Energy investment grows at GDP growth in a BAU (business-as-usual) scenario. Growth in building energy technology investment matches projected clean energy technology investments under a moderate action scenario (~7% CAGR). There is aggressive clean energy technology investment growth of ~22% CAGR in a net-zero scenario which, according to the IEA, “annual investment in clean energy rises to USD 4 trillion by 2030”,

more than triple current levels. Given our technology strategy, executed through JLL Technologies, we are positioned to capture opportunities from disruption by partnering with startups and technology providers rather than risks associated with being ill prepared and negatively disrupted.

Our deep expertise, scale, brand, global reach, and commitment to prioritize and fund technology, places us in a unique position. We are moving fast and taking a bold but disciplined approach towards investments in technology, and are particularly focused on technologies that improve building operations, like our recent acquisitions of the software platforms Hank and Building Engines. From these types of investments, we intend to increase direct technology revenue through growth in existing markets and entrance into new markets, and we also expect them to create revenue opportunities for our climate consulting services.

Climate change consultancy

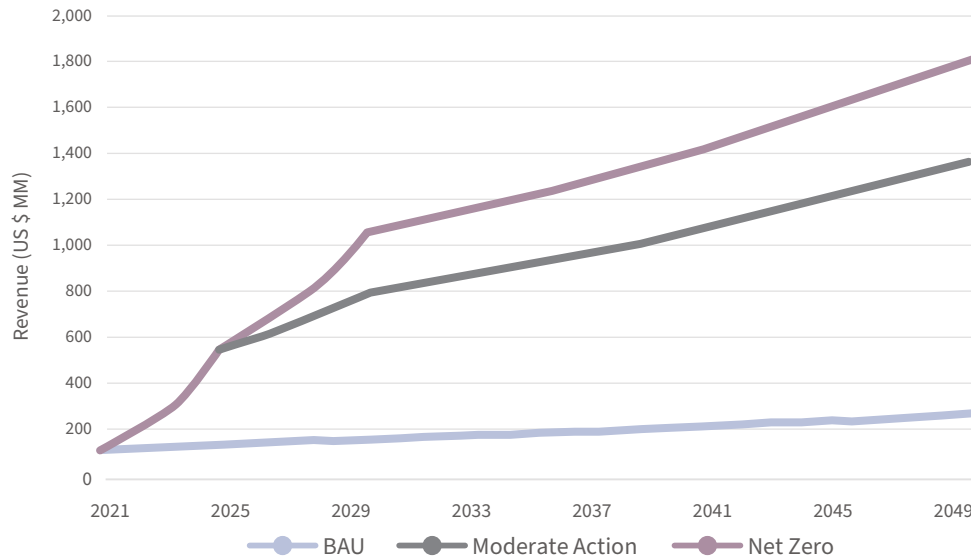
The market opportunities in climate change consulting have already started to materialize, and aspects of the net-zero scenario – such as coordinated policy inclusive of carbon pricing, increased consumer demand for climate solutions, and rapidly advancing clean energy technology – would greatly accelerate this trend. JLL’s sustainability services has expanded its area of focus to specifically address these market trends and were analyzed to determine the opportunity of increasing revenue from climate change consultancy. Based on the IEA World Energy Outlook data of clean energy investment for buildings, we modeled three scenarios: business-as-usual, moderate action and net-zero. Scenario assumptions and details found in **Figure 10**.

Figure 10. Climate change consultancy scenario summary

Scenario	Description	Scenario CAGR Assumptions
Business - as - usual	Based on IEA projections of Clean Energy Investment for Buildings under a current policy scenario, assumes that JLL’s sustainability services growth will follow the projected GDP average growth rate of 3.6% until 2030 and then 2.7% until 2050.	2025: 3.6% 2030: 3.6% 2050: 2.7%
Moderate action	Based on IEA projections of Clean Energy Investment for Buildings under the Announced Pledges Scenario, assumes that JLL’s sustainability services revenue will grow at an accelerated rate until 2025 given current pace and momentum of carbon reduction commitments, then grow at the IEA projected rate of 7.8% until 2030 and then level off at the projected GDP growth of 2.7% until 2050.	2025: 14.8% 2030: 7.8% 2050: 2.7%
Net zero	Based on IEA projections of Clean Energy Investment for Buildings under a Net Zero scenario, assumes that JLL’s sustainability services revenue will grow at an accelerated rate until 2025 given current pace and momentum of carbon reduction commitments, then grow at the IEA projected rate of 14.1% until 2030 and then level off at the projected GDP growth of 2.7% until 2050.	2025: 14.8% 2030: 14.1% 2050: 2.7%

Under all scenarios it is estimated that JLL consultancy revenue would grow due to increased demand for carbon reduction and building efficiency strategies. The most growth would be realized under a net zero scenario and under business-as-usual or moderate action scenarios at a slower pace (Figure 11).

Figure 11. JLL Climate consultancy scenario analysis

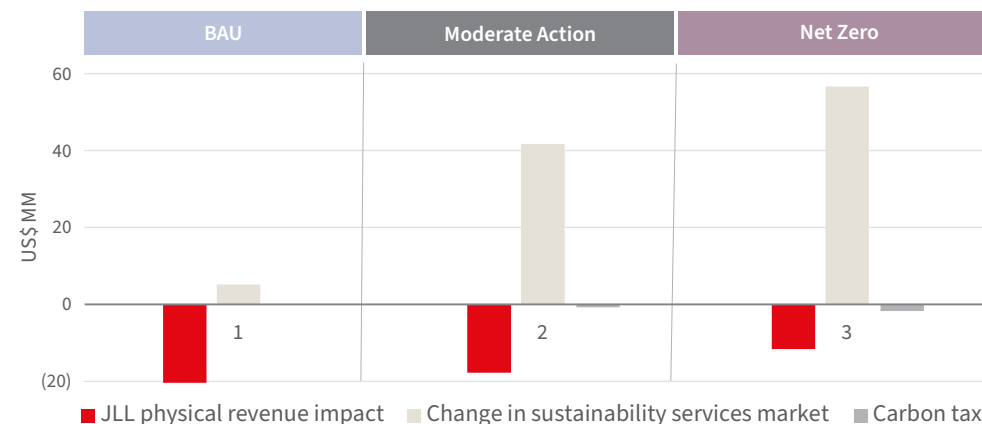


Based on IEA World Energy Outlook Data

Summary Findings

Based on our quantitative analysis of climate-related risks and opportunities (**Figure 12**), where the impacts are projected for 10 select JLL markets, not the entire portfolio, and GDP at risk due to physical impacts is scaled to 2020 revenue data and projected out to 2050 using global GDP growth (3%), the climate scenario assessment indicates that the potential financial opportunities for our business are greater than the financial risks under all three climate scenarios, with the strongest opportunities existing under a net-zero scenario. We anticipate lower climate-related financial risks as our business model is not carbon-intensive and the mitigation measures outlined in our JLL 2020 [Global Sustainability Report](#) are already in place for many risks. Moreover, our investments in property technology, our green building solutions and our climate change consulting provide significant and scalable avenues to realize the identified climate-related opportunities.

Figure 12. Average annual risks and opportunities to JLL



Note: market opportunity in light grey is the year-over-year increase in climate consulting revenue, not average total revenue.

Next steps

This quantitative analysis and the inclusion of our phase 3 results in JLL's 10-K marks an important step in our process of examining and understanding the implications that the changing climate has on our business. However, we recognize that our commitment to 'net zero by 2040' requires us to build on our progress and continue to integrate sustainability measures throughout our organization.

JLL's disclosure is an evidence-based approach using the latest research and climate science to inform our predictions on climate-related risk and opportunity across different time scales. As reflected in this report, we will monitor the research and science for updates - particularly as they relate to extreme climate shocks - and will adjust our future analysis appropriately. Future analysis will include the potential reputational risks and opportunities associated with our response to climate change as perceived in the market.

We believe there is a strong and direct correlation between our ESG performance and the long-term health and success of our business. By putting our sustainability program into action, we can deliver transformative changes for our business, people, clients, communities and planet. Our market position enables us to take actions that contribute to our purpose: to shape the future of real estate for a better world. In so doing, it identifies us as a responsible organization, brings our purpose to life, adds value to our brand, and helps us attract and retain talent.

Our capabilities

It's one thing to set ambitious net-zero targets, it's another to translate them into concrete business steps. JLL experts enable organizations on how sustainability can maximize the value of their real estate portfolio and provide solutions to make buildings smart, healthy and productive.

jll.com/sustainability-services

Appendix

Limitations and caveats

Any modeling effort is only an approximate depiction of the economic forces it seeks to represent, and the economic models developed for this analysis are no exception. Although various limitations and caveats might be listed, noteworthy limitations of the modeling in this analysis include:

- Estimates are limited by available public information. The analysis relies on information reported by government agencies, nongovernmental organizations and private subscription data providers. The analysis did not attempt to verify or validate this information except as otherwise noted.
- The relationship between JLL revenue and market conditions is based on an historical relationship. The economic impact of climate change as well as other changes in economic conditions present both opportunities and risks for businesses. This analysis relied on the historical relationship between JLL revenue and market conditions. To the extent that JLL's reactions to the economic impacts of climate change differ from historical reactions to changes in economic conditions, the impact of climate change on JLL revenue may diverge from the estimates produced by this analysis.
- Peer-reviewed academic research on the economic implications of climate change has limitations. Although this analysis relies on recent, peer-reviewed academic research on the economic implications of climate change, this literature has its limitations. This growing academic literature is constrained by available historical data that may not fully capture how climate change will impact future economic conditions. Accordingly, estimates produced by this analysis should be viewed as high level.
- Peer-reviewed academic literature on the impact of climate change on migration is especially limited. Methodology for estimating the impact of temperature increase on productivity, sea-level rise on production, and extreme climate shocks on production use reasonably standard modeling approaches found across multiple peer-reviewed academic papers. Peer-reviewed academic literature modeling the impact of climate change on migration has more severe data and methodological limitations. See, for example, Berlemann and Steinhardt (2017).
- Production functions are a stylized depiction of city economies. Estimates for the impact of sea-level rise on production and the impact of climate-induced outmigration on production rely on city-specific production functions to translate changes in factors of production (capital, labor and land) on city GDP. The production functions used for this analysis are, by their very nature, a stylized depiction of the economy. As such, they cannot capture all of the detail of a city's economy, or the impact of climate change on it.
- Estimated economic impacts are based on stylized modeling of climate change. Climate change will have far-reaching impacts on the global economy with significant variation across communities, sectors and geographies. This analysis relies on approaches used in peer-reviewed academic literature. Other approaches to modeling the effects of climate change could lead to larger or smaller impacts.



Talk to us about Sustainability

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